SCORPIONS OF THE NATIONAL REACTOR TESTING STATION, IDAHO[1]

Dorald M. Allred[2]

ABSTRACT.— During ecological studies in 1966 and 1967, 282 scorpions of *Paruroctonus boreus* (Girard) were collected in can pit-traps in 12 plant communities. The ideal habitat was in vegetated areas where the total ground cover was more than 85 percent, of which at least 60 percent was broad-leaf shrubs and 5 percent grasses. Populations of ants and spiders were highest where scorpions were most abundant. Scorpions were most active above ground during August, with about half as much activity during July. None were found prior to May or after September.

Ecological investigations of ectoparasites and other arthropods of the National Reactor Testing Station were conducted by personnel of Brigham Young University from June 1966 to September 1967. Can pit traps that were used to trap ground-dwelling animals captured 282 scorpions of the species *Paruroctonus boreus* (Girard) in 12 plant communities. Some ecological data on these arachnids are reported herein. I am grateful to John Johnson for the identification of most of the specimens.

The National Reactor Testing Station, situated in southeastern Idaho approximately 30 miles west of Idaho Falls, is in the Snake River section of the Columbia River Basin. The vegetation is typical of the cool, northern desert shrub biome and is characterized predominantly by sagebrush (*Artemisia tridentata*), rabbitbrush (*Chrysothamnus*), and grasses of the genera *Agropyron*, *Elymus*, *Oryzopsis*, and *Stipa*. Allred (1968) described the ecological aspects of the station and defined and pictured the 12 study sites included here. The vegetative cover of each of these study sites is summarized below. For further details on the vegetation of the station, consult Atwood (1970).

Site 1: Chrysothamnus 38%, *Artemisia* 24%, grasses 15%, forbs 10.5%, *Opuntia* 6%, *Tetradymia* 1.5%, bare ground 5%.

Site 2: Artemisia 50%, *Chrysothamnus* 15%, grasses 15%, *Eurotia* 10%, forbs 7%, bare ground 3%.

Site 3: Elymus 50%, forbs 35%, bare ground 15%.

Site 4: Oryzopsis and *Stipa* 90%, shrubs 5%, forbs 5%.

Site 5: Juniperus 40%, forbs 1%, bare ground 59%.

Site 6: Chrysothamnus 30%, *Tetradymia* 30%, *Artemisia* 20%, grasses 5%, forbs 5%, bare ground 10%.

Site 7: Chrysothamnus 41%, *Artemisia* 30%, *Eurotia* 9%, forbs and grasses 4%, bare ground 16%.

Site 8: Artemisia 30%, *Atriplex* 26%, *Chrysothamnus* 5%, forbs and grasses 1%, bare ground 38%.

Site 9: Chenopodium 40%, *Eurotia* 35%, *Artemisia* and *Chrysothamnus* 2%, *Salsola* 2%, forbs 1%, bare ground 20%.

Site 10: Artemisia 68%, *Opuntia* 7%, grasses 7%, forbs 5%, bare ground 13%.

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[2]Department of Zoology, Brigham Young University, Provo, Utah 84602.

Site 11: Chrysothamnus 30%, grasses 26%, *Tetradymia* 22%, *Artemisia* 5%, *Opuntia* 5%, forbs, *Atriplex* 2%, bare ground 5%.

Site 12: Juniperus 30%, *Chrysothamnus* 15%, *Eurotia* 15%, *Artemisia* 13%, grasses 10%, forbs 6%, *Opuntia* 1%, bare ground 10%.

Ten can pit traps spaced at 15-meter intervals were placed in a row at each site. These were open continuously from April to November. Cans were visited each day of a three-day period approximately every two weeks to collect the trapped animals. These visits were correlated with the times that other traps which were designed to capture rodents were in operation on each study site.

Discussion

Species distribution.— The occurrence of *Paruroctonus boreus* at the station is not unusual. This "northern scorpion," as it was designated by Ewing (1928), occurs from the Mojave Desert of California and southwestern Nevada northward into the Great Basin of Nevada, Utah, and Idaho; in the Upper Colorado River Basin of Arizona, Colorado, and Utah; in the Snake River and Columbia River basins of Idaho, Oregon, and Washington; in the Missouri River Basin of Montana, and in the southern part of Canada (Gertsch and Soleglad, 1966). Although this was the only species found at this northern latitude, Gertsch and Allred (1965) indicated that *Hadrurus spadix* occurs in eastern Oregon in the Columbia River Basin. Williams (1970a) also noted the occurrence of *H. spadix* in southwestern Idaho. Johnson and Allred (1972) indicated that the ranges of *Anuroctonus phaeodactylus* and *Vaejovis confusus* extend into northern Utah, and Anderson (personal correspondence) stated that *A. phaeodactylus* occurs in Idaho. Apparently these three species do not occur at the station, although perhaps they occupy a much different habitat than typified by the twelve study sites investigated and consequently were not captured in these studies.

Habitat preference.— Williams (1970b) found that the relative abundance of scorpions was related to habitat type. He observed that *Vaejovis confusus*, for example, was predominant in nonrocky, fine-textured soils, whereas some other species occurred primarily in rocky habitats. Undoubtedly the presence and relative abundance of scorpions are determined by edaphic factors as well as the vegetative components with their associated arthropods which serve as available food. At the Nevada Test Site, Gertsch and Allred (1965) found scorpions of *Paruroctonus boreus* most abundant in the Pinyon-Juniper community. They were seldom found in other plant types typical of the Mojave Desert but did occur somewhat abundantly in the *Artemisia* community typical of the northern deserts.

At the National Reactor Testing Station, scorpions of *P. boreus* varied significantly in abundance among the different plant communities (Table 1). In four of the communities none were found, and in two other communities only one and four specimens were taken, respectively. The ideal habitat for this species at the station

is in those vegetated areas where the total ground cover is more than 85 percent, of which about 60 percent is broad-leaf shrubs, and where grasses constitute at least 5 percent. The presence of forbs apparently is not influential to a significant degree. In all areas where populations of scorpions were highest, the total ground cover was above 85 percent. However, one exception where no scorpions were found was Site 4, where the cover was 100 percent but where 90 percent of this was grass with no shrubs present. In these same high-population areas (except the 90 percent grass area mentioned), the coverage by broad-leaf shrubs was above 60 percent, with two exceptions: Site 8, with a 61 percent shrub coverage where no grass occurred: and Site 7, with a 71 percent shrub coverage where grass coverage was less than 2 percent.

With one exception, populations of ants and spiders were also highest at those sites where scorpions were most abundant (Allred, 1969; Allred and Cole, 1971). On sites 4, 5, 8, and 9, where scorpions were not found, spiders were essentially absent from sites 4, 5, and 9, and ants were absent from sites 5 and 9.

Sex ratios.— Gertsch and Allred (1965) used can pit traps almost exclusively to capture scorpions in Nevada. The sex ratio of males to females collected there was 6 to 1. Johnson and Allred (1972) used an ultraviolet light for most of their collections and found the male to female ratio to be 1 to 1.9. In this study in Idaho, which utilized pit traps exclusively, the ratio was 5.5 to 1. From these data I assume that the males wander much more extensively than do the females and consequently are more apt to fall into the pit cans. Johnson and Allred (1972) noted that the females of *Anuroctonus phaeodactylus* were seen only at the entrances to their burrows. This same phenomenon of limited movement by the females, at least for most periods of the year, may also be applicable to *Paruroctonus boreus* in Idaho.

Table 1. Seasonal occurrence and abundance of *Paruroctonus boreus* at 12 sites at the National Reactor Testing Station during 1966 and 1967.

Site	No. specimens					
	May*	Jun.	Jul.	Aug.	Sep.	Total
1	6	3	23	9	4	45
2			15	26		41
3	2				2	4
4						0
5						0
6		2	11	24	1	38
7				1		1
8						0
9						0
10	2	3	6	25		36
11		8	14	43	2	67
12		2	9	35	4	50
Total	10	18	78	163	13	282

*Numbers for May are doubled, inasmuch as traps for that month operated only during 1967.

Seasonal occurrence.— At the National Reactor Testing Station, cold temperatures prevail from October to April, and snow frequently lies on the ground for much of that period. Scorpions were most active above ground during August, with about half as much activity during July (Table 1). None were found prior to May or after September. Immatures were found all summer except in May, and females were found from May to September (Table 2).

Table 2. Total numbers of *Paruroctonus boreus* taken seasonally at the National Reactor Testing Station during 1966 and 1967.

Stage or sex	No. specimens					
	May*	Jun.	Jul.	Aug.	Sep.	Total
Immature	4		6	1	3	14
Male		9	61	150	4	224
Female	6	9	11	12	6	44

*Numbers for May are doubled, inasmuch as traps for that month operated only during 1967.

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